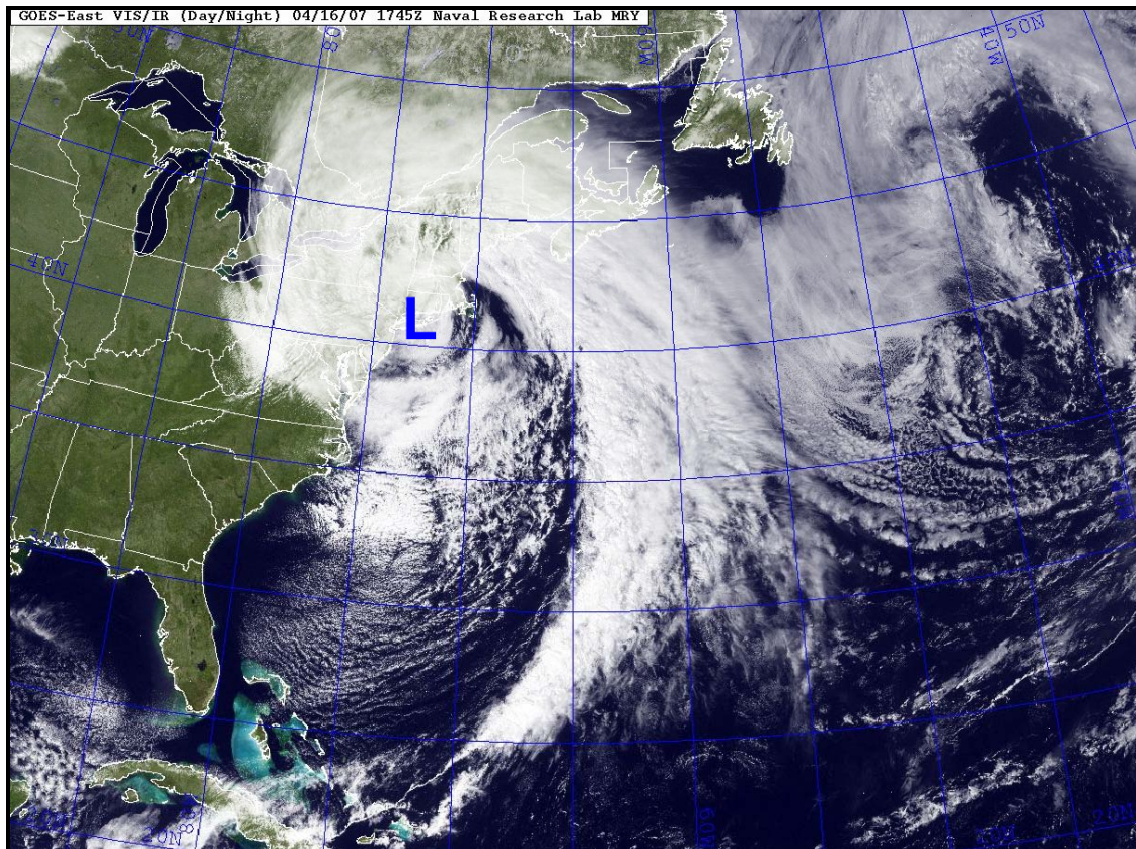




# Headliner!

## *A Late Nor'easter in 2007*

May 2 2007



**Figure 1. GEO-Color image depicting the Nor'easter storm over the northeast sector of the US and western Atlantic Basin.**

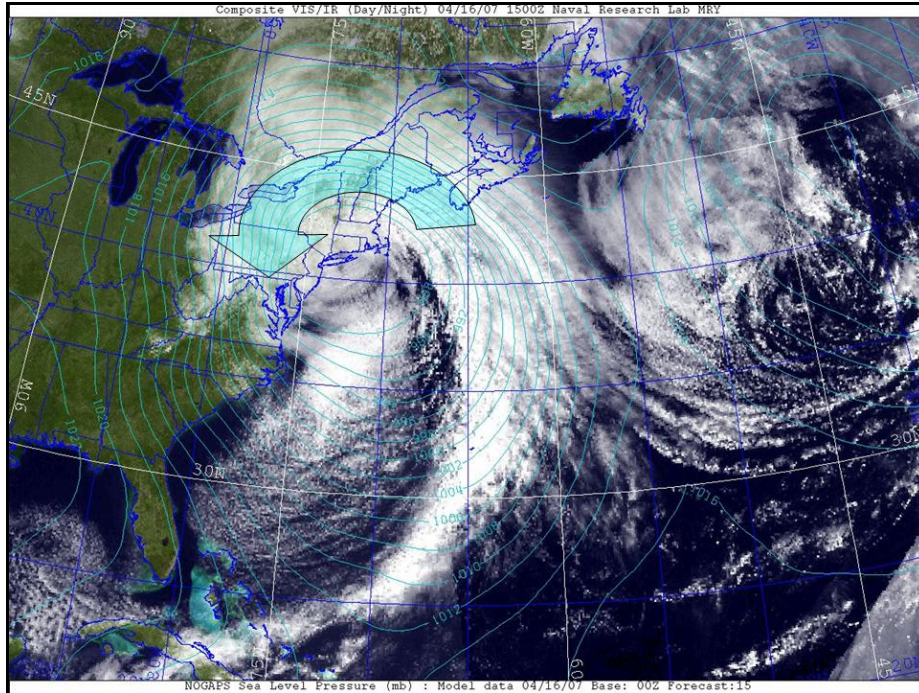
A very powerful spring time storm system moved up the Atlantic seaboard from 15-17 April, producing widespread coastal flooding. According to the Associated Press, as the storm progressed northward along the US east coast, there were several tornados reported in Florida and the Carolinas, severe beach erosion, particularly along the New Jersey coast, massive power outages, up to 600 canceled flight from 3 major New York airports, up to 17 inches of heavy wet snow in Vermont and upper New York state. Overall, there were 18 storm-related deaths, along with a costly clean-up process. On Sunday, 15 April, dozens of additional flights were cancelled the previous day in Philadelphia, Boston, and throughout New England. The 20,000 participants who ran Sunday's Boston Marathon braved 30 mph winds and several inches of rain. The following day, the storm reached the height of its coastal impact.

The three major airports around New York reported some 600 canceled flights, and Amtrak service was greatly disrupted between Boston and Washington DC. Atop New Hampshire's Mount Washington, sustained winds reached 100 mph with gusts reported at 156 mph. Parts of Canada also endured the wrath with 175,000 homes losing power around Quebec. The impact was not that different from that experienced from hurricanes. The meteorological event is known as the "Northeastern storm", due to its gale to hurricane force northeast winds blowing onshore. Local New Englanders have historically coined this storm as "Nor'easter", immortalized in folk tales, and part of a tragic legacy for seafarers and landlubbers alike.

The figure above is a GEO-Color image that illustrates the extensive cloud coverage associated with this powerful Nor'easter at about the time of its peak intensity, around early afternoon (local east coast time) on April 16. A deep low is spinning just off New York and an associated strong cold front extends into the Atlantic.

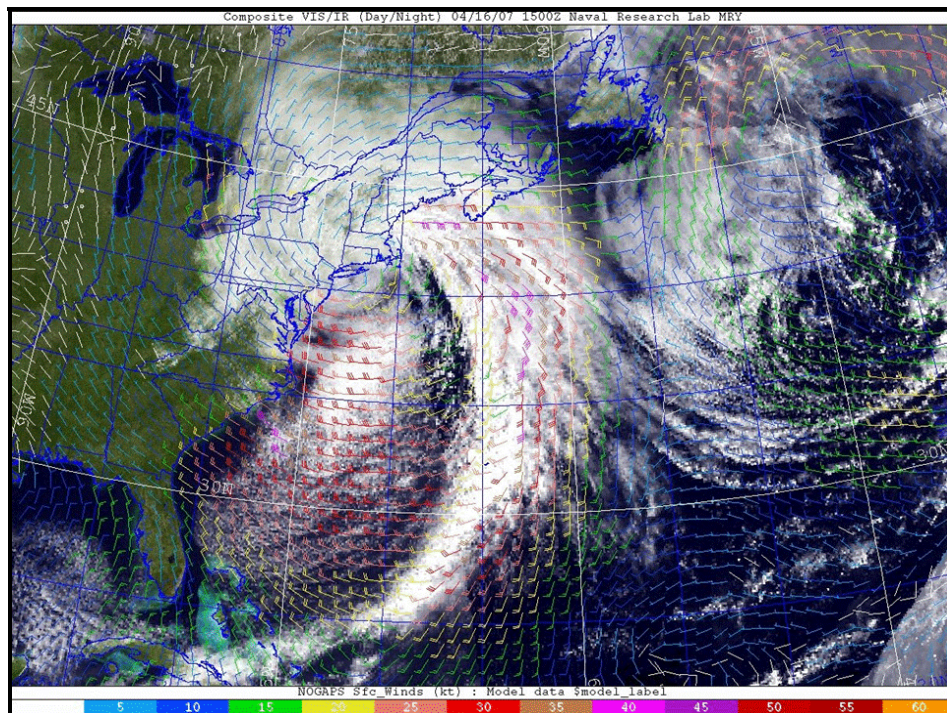
Nor'easters are defined as cyclonic storm systems that occur several times between September and April of every year. These systems usually develop over the relatively warmer waters off the Gulf states and southern US coast and progress northward, with more vigorous development over the waters adjacent to New England and Canada's Maritime Provinces. Heavy beach erosion, hurricane force winds, as well as heavy rain and snow are often associated with these systems. The intensity of the storms is fueled by the presence of a cold Canadian air mass interacting with relatively warm Gulf coast disturbances. More information on various aspects of Nor'easters can be found in [wikipedia](http://wikipedia).

The figure below displays the surface pressure pattern associated with this system. The winds blow in a counterclockwise (or cyclonic) pattern about the Low, with stronger wind speeds associated in regions where the pressure contour lines are closest to each other. The winds are strongest in the region as marked within the annotated aqua blue arrow, from the Atlantic Ocean through Maine, New Hampshire, Vermont, upstate New York, and finally through Pennsylvania and Maryland. The lowest barometric pressure recorded for the storm was 958 mb, similar to the strength of a category 3 hurricane.



**Figure 2. Similar to Figure 1 but with an overlay of NOGAPS surface pressure. Strongest winds are featured within the arrow.**

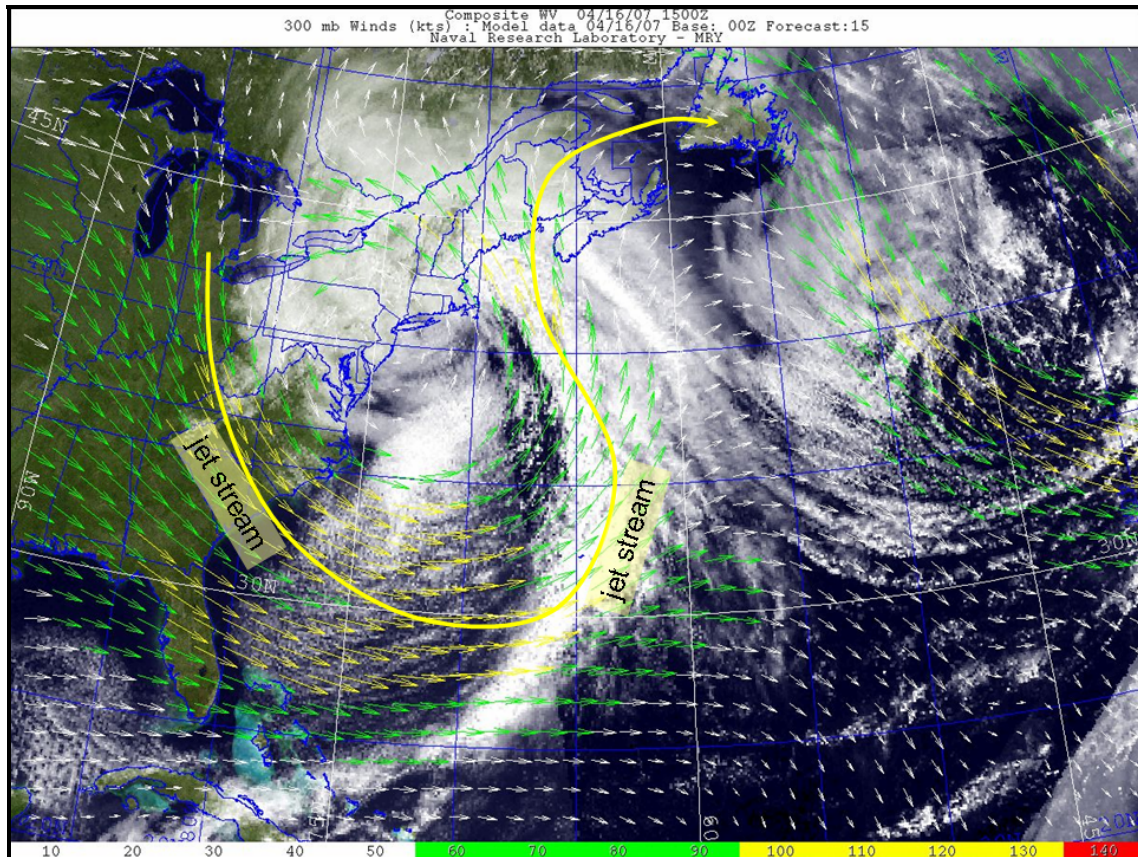
Below, surface wind barbs are plotted from a Navy forecast model. The strongest winds are the easterlies situated just offshore of the Maine coast, with wind speeds greater than 40 knots.



**Figure 3. GEO-Color image with surface wind field obtained from the Navy (NOGAPS) model.**

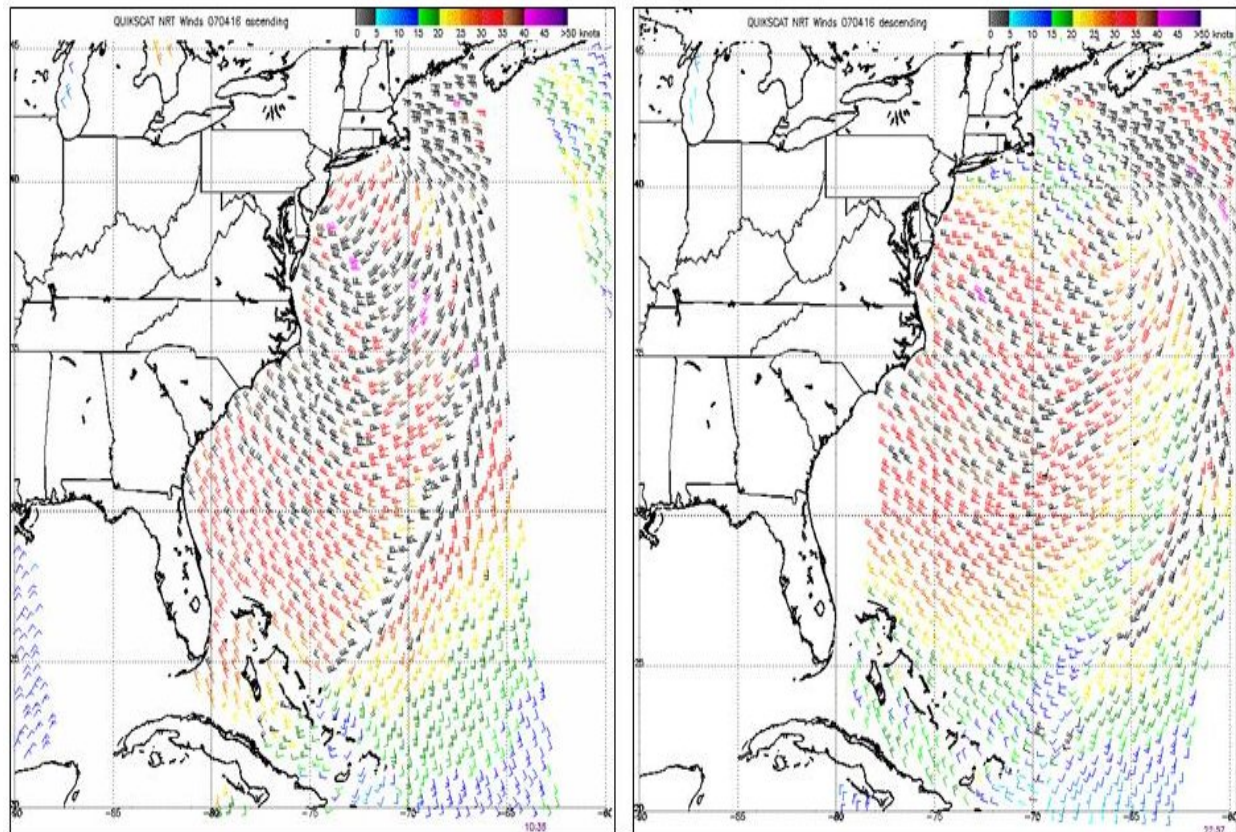
Around the low, the higher speeds are over the ocean, as land features tend to create friction and a slowing of the wind speed near the surface.

In the figure below, the model overlay of upper level winds are shown. The Nor'easter storm is defined by the jet stream (annotated in yellow) that carved out a deep trough that defined the storm. Jet streams provide the atmospheric 'engine' for the storm to develop and intensify. The jet stream pattern suggests that the storm is stalling off the New Jersey coast, providing ample opportunities for massive flooding, beach erosion, and wind damage.



**Figure 4.** Same image as above figure but for upper level wind field obtained from NOGAPS. The jet stream is annotated.

QuikSCAT images (below) show satellite-sensed winds over the surface of the ocean – the top figure represents data from the morning, while the bottom figure represents afternoon and evening data. The symbols tell forecasters the speed and direction of the winds over the ocean. The colors for each wind barb aid the user in determining the wind speed. The regions of interest are higher wind regions in red (greater than 30 knots) and pink (greater than 40 knots). QuikSCAT is an invaluable resource in weather forecasting, climatology, weather modeling, and the tracking of tropical cyclones. For the Nor'easter, forecasters are able to track and predict the progress and intensity of this storm by accessing ocean wind information that was nonexistent just several years ago. More information on this instrument can be obtained from [NOAA-QuikSCAT](http://www.noaa.gov/quikscat).



**Figure 5. Composites of Quikscat winds provided by NOAA-NESDIS for 16 April 2007. The left image represents data collected during morning passes while the right image represents data collected during the afternoon and evening passes.**

Finally, satellite precipitation images below show accumulated rainfall amounts associated with the storm over the 2-day period that the storm moved up the coast (15 -17 April). Each image provides precipitation totals during a 24 hour period for that particular day. The impacts of the storm's south-to-north passage are readily observable in these images. The 16 April image shows the heavy precipitation pattern particularly along the Carolinas and Middle Atlantic States, while the next day shows the New England coast bearing the brunt of the storm.

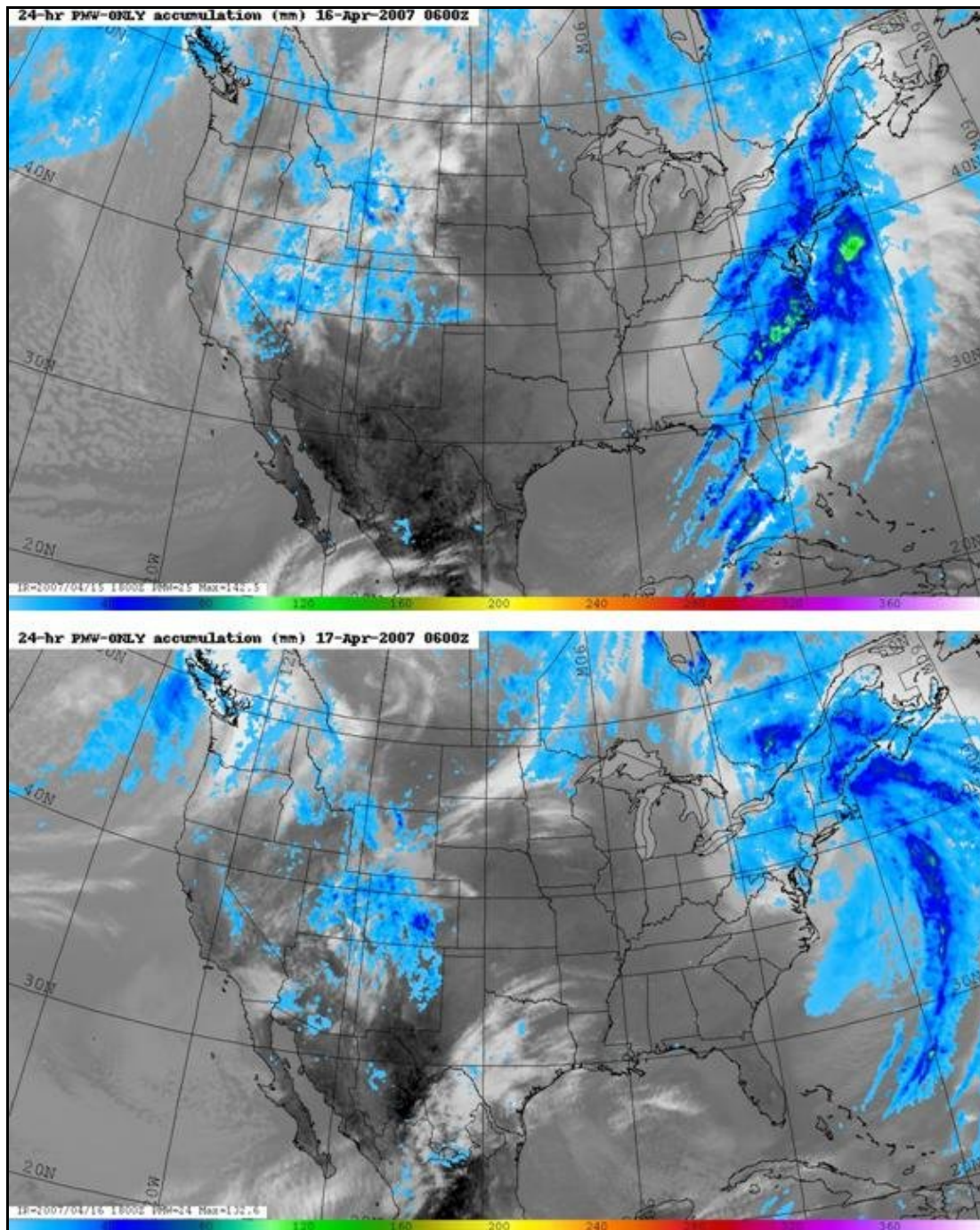


Figure 6. Accumulated 24 hour precipitation totals: The top panel represents precipitation totals from the morning of 15 April through the morning of 16 April, while the bottom panel represents precipitation totals from the morning of 16 April through the morning of 17 April.